



PATENT APPLICATION  
STC-03-0010

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of: Scott F. Mitchell  
Gopalakrishnan Juttu  
Robert Scott Smith

Serial No.: 10/748,418

Group Art Unit: 1764

Filed: December 30, 2005

Examiner: Thuan D. Dang

For: Process for Alkane Aromatization Using Platinum-Zeolite Catalyst

Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

AFFIDAVIT UNDER 37 CFR §1.132

Gopalakrishnan Juttu, being duly sworn, deposes and says that:

I am a scientist for SABIC Americas, Inc., at the SABIC Technology Center in Sugar Land, Texas.

My educational background is as follows: I hold a Bachelor of Science degree in Chemical Engineering from the Indian Institute of Technology, Madras, India granted in 1996 and a Doctor of Philosophy degree in Chemical Engineering from the University of Delaware granted in 2001.

My duties at the SABIC Technology Center include research in the field of catalytic reaction of an alkane using a zeolite catalyst to produce aromatics, including the synthesis and evaluation of catalysts such as those disclosed in the U.S. patent no. 4,891,463 ("Chu").

I have worked in the field of catalysis, both in industry and in academia, for approximately eight years. I am the author or co-author of three articles on the subject and have approximately two patents issued and approximately three patent applications pending naming me as an inventor or co-inventor in this field.

In view of my qualifications as specified above, I consider myself to be an expert in the art of alkane aromatization and related catalysts, specifically the catalytic reaction of an alkane using a zeolite catalyst to produce aromatics. I have read the Office Action of March 7, 2006, for the above-identified patent application and I have reviewed and am familiar with the subject matter disclosed in Chu.

The following Examples and Comparative Example illustrate a catalyst of the claimed invention compared to catalysts containing other metals disclosed in Chu.

### **Synthesis of Catalysts**

25g of ZSM-5 (ammonium form,  $\text{SiO}_2/\text{Al}_2\text{O}_3=80$  from Zeolyst) were bound with 5.56g of precipitated silica (Ultrasil VN3SP from Degussa) and 40g of 50wt% colloidal silica (Ludox TM-50 from Aldrich). The resulting material was calcined at 550°C and then crushed and sized to 20/40 mesh particles. This material was further ion exchanged with 0.5M ammonium nitrate and calcined at 550°C. This sample was split into four equal portions of 2.85g each and were impregnated as indicated in the table below:

Table 1 Impregnation of various metals on ZSM-5

Sample name	Salt used	Salt amount (g)	Solution volume (ml)
Pt/ZSM-5	Tetra amine platinum (II) nitrate	0.0196	4
Zn/ZSM-5	Zinc nitrate nonahydrate	0.0434	4
Re/ZSM-5	Ammonium perrhenate	0.0139	4
Fe/ZSM-5	Iron (III) nitrate nonahydrate	0.0640	4

The catalysts were then calcined at 300°C before loading the reactor.

2g of each catalyst were loaded in the reactor for testing. The catalysts were reduced with hydrogen and treated with hydrogen sulfide prior to testing. The feed consists of propane. The catalysts were tested at 500°C at 20psig.

The results from the catalytic testing are summarized in the table below:

Table 2 Catalytic activity for propane aromatization

Catalyst	Conversion (%)	BTX Yield (%)	ethane/methane (%)
Pt/ZSM-5	71	19	14.1
Zn/ZSM-5	26	10	1.0
Re/ZSM-5	43	10	3.5
Fe/ZSM-5	25	5	1.3

As can be seen from the data presented above, Pt/ZSM-5 is the most active catalyst among the catalysts tested, has the highest yield of benzene, toluene and xylene and has the highest ethane to methane ratio (making very little methane compared to ethane).

SERIAL NO. 10/748,418  
MITCHELL, JUTTU, SMITH

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Further deponent saith not.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affix my signature this

4<sup>th</sup> day of August, 2006

Gopalakrishnan Juttu  
Gopalakrishnan Juttu

On this 4<sup>th</sup> day of August, 2006 personally appeared before me,  
Gopalakrishnan Juttu, known to me to be the person who executed the foregoing affidavit and  
acknowledged the same to be her free act and deed.

Jim D. Wheelington

Jim D. Wheelington  
Notary Public

My Commission expires June 7, 2009

